

# Effect of exclusion policy on the control of outbreaks of suspected viral gastroenteritis: Analysis of outbreak investigations in care homes

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**Background:** Norovirus is an important cause of gastroenteritis outbreaks in care homes. Differences exist in the recommended duration of exclusion for affected staff during an outbreak.

**Methods:** We conducted a retrospective analysis of outbreak reports in 2006 and 2007 managed by health protection staff in 2 counties with differing exclusion policies, one advising exclusion of affected staff and isolation of residents for 72 hours and the other for 48 hours after the resolution of symptoms. We compared attack rates and average numbers of cases in residents and staff, adjusting for type of care home and staffing rate.

**Results:** A total of 96 outbreaks were managed, 63 with a 72-hour exclusion policy and 33 with a 48-hour exclusion policy. The longer exclusion policy resulted in lower mean number of cases among staff (6.5 vs 9.6;  $P = .044$ ) and a lower overall attack rate (32.6% vs 35.1%;  $P = .05$ ). No differences in the mean number of cases or the attack rate among residents were seen.

**Conclusion:** This brief study suggests that a longer exclusion policy reduces the number of cases among staff affected with viral gastroenteritis, possibly resulting in less staff absences. This could have potential benefits, particularly when resources are limited.

**Key Words:** Norovirus; outbreak control; exclusion policy; health care; infection control.

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Norovirus (NoV) is an important cause of infectious gastroenteritis worldwide. It is readily transmitted from person to person by the fecal-oral route and via environmental contamination.<sup>1</sup> Foodborne outbreaks also are common, associated mainly with shellfish, frozen berries, and salads.<sup>2-7</sup> Because of the lack of long-lasting immunity in those affected and the small infective dose required, an outbreak can involve larger numbers of people.<sup>8,9</sup>

Viral shedding normally peaks between 24 and 72 hours,<sup>10</sup> although virus can be detected in feces for up to 2 weeks postinfection.<sup>11</sup> The impact of viral shedding beyond 72 hours in otherwise asymptomatic individuals is not clear; thus, most infection control guidelines recommend exclusion of food handlers and staff for a period of 48 hours after the resolution of symptoms, in line with many bacteria-caused gastrointestinal illnesses. Some guidelines recommend a longer exclusion period of up to 72 hours.<sup>12,13</sup> To date, no comparative study of the 2 different exclusion periods has been published.

In 2005, the Norfolk team of the Norfolk, Suffolk and Cambridgeshire Health Protection Unit (HPU) changed their policy for the duration of exclusion of staff affected with viral gastroenteritis from 48 hours to 72 hours. The decision to change to a longer exclusion policy was based on the evidence of a prolonged viral shedding and a shift toward a longer exclusion period in the United States. This decision was made in consultation with all of the Environmental Health Departments in Norfolk, which normally enforce infection control measures. However, the Suffolk team of the same unit maintained the 48-hour exclusion after resolution of symptoms, in line with national guidelines.<sup>14</sup> We

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conducted an analysis of outbreaks in care homes in the UK counties of Norfolk and Suffolk to assess the effect of the 2 different exclusion policies by the HPU on outbreak management and outcomes in 2 very similar counties.

## METHODS

Two health protection doctors and 3 nurses manage health protection incidents and outbreaks in Norfolk, whereas 2 health protection doctors and 2 nurses cover Suffolk. Norfolk has a larger population, with 825,900 people (23.6% over age 65 years), whereas Suffolk has only 696,100 people (21.6% of the total population over age 65 years).<sup>15</sup>

Care homes are residential, with both short-term and long-term residents, providing accommodation, meals, and personal care (eg, help with washing and eating).<sup>16</sup> Care homes with nursing care (or nursing homes) are the same as those without nursing care but have registered nurses who can provide care for more complex health needs. Suffolk has a total of 142 care homes, of which 40 are nursing homes, and Norfolk has 207 care homes, 49 of which are nursing homes.<sup>16</sup>

We conducted an evaluation of the outbreaks managed with a policy of 72-hour exclusion of affected staff and isolation of affected residents as the intervention group and managed with a 48-hour policy as the control group as part of an audit of the management of gastroenteritis outbreaks in care homes. Apart from the different exclusion policies, outbreaks in Norfolk and Suffolk were managed in the same way, in line with national guidelines that, although written for hospital care settings, also are applicable and widely used for community-based care settings (Table 1).<sup>14</sup>

We reviewed case notes of outbreaks of suspected or confirmed viral gastroenteritis in care homes in both counties reported to the HPU between January 1, 2006 and December 31, 2007. Outbreaks were excluded if a bacterial or parasitic cause was identified, because we were interested only in suspected viral gastroenteritis.

Agreed-upon standard operating procedures for laboratory investigation of gastroenteritis outbreaks and sporadic cases exist in the UK.<sup>17,18</sup> From each outbreak, fecal samples from a maximum of 6 symptomatic patients are tested. NoV polymerase chain reaction is the preferred assay for screening. All specimens from a negative outbreak and 1 specimen from a positive outbreak are sent to the reference laboratory for further testing or virus characterization. Only unformed stools are tested for viruses, meaning that some outbreaks are not investigated if symptoms resolve quickly and insufficient liquid stool samples are available. Rotavirus or adenovirus are not routinely tested for in outbreaks in elderly person.

**Table 1.** Summary of control measures recommended by Chadwick et al<sup>14</sup>

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- Isolate or cohort symptomatic residents.
  - Wear gloves and apron for contact with affected patients and change these between patients.
  - Wash hands with soap and water after contact with an affected patient.
  - Exclude affected staff from duties until symptom-free for 48 hours.
  - Close of the facilities to new admissions.
  - Limit visits and advise visitors on handwashing.
  - Promptly clean body fluid spillages.
  - Increase the frequency of routine cleaning.
  - Use 0.1% (1000 ppm) hypochlorite to disinfect hard surfaces and clean soft furnishings with either steam or detergent and hot water.
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We also excluded outbreaks in warden-controlled flats or houses, because these settings are similar to private homes, in which residents are more independent and normally care for themselves, with some use of communal areas. Moreover, these settings are managed differently from ordinary care homes.

Case notes were reviewed by 2 researchers. For each outbreak, information was collected on the care home characteristics, number of residents and staff, cases among residents and staff before and after intervention, and dates of onset of the first case and when the outbreak was first reported to the HPU.

An outbreak was considered closed when no new cases had been reported for 1 week (ie, date of the last reported case plus 7 days). The period of time between the date of onset of the first case and the closing date was considered the total duration of an outbreak (ie, date of onset to date of closure of an outbreak). The duration of intervention was taken as the time from the date when the outbreak was first reported to the HPU until the closure of the outbreak (ie, date first reported to date of closure). The delay in reporting outbreaks to the HPU was measured as the date of onset of the first case to the date first reported.

Attack rates were estimated from the information given to the HPU. The attack rate before intervention was calculated as cases reported to the HPU on or before the date of first reporting over the number of exposed care home population (ie, residents and staff). The attack rate after the intervention was initiated was calculated as cases reported after the outbreak was reported to the HPU over the number of susceptible persons (ie, total population minus those already affected).

## Analysis

The characteristics of care homes (eg, type of home, number of residents and staff) and outbreaks (eg, cases reported) before any intervention were compared

according to whether the care home was advised to exclude affected staff and residents for 48 hours or 72 hours after the last bout of symptoms (ie, diarrhea or vomiting), according to local policy. Variables were compared using the *t*-test, or the Mann-Whitney *U*-test if the variables were not normally distributed (skewness  $\leq 1$  or  $\geq 1$ ) or for categorical variables.

Outbreak outcomes (ie, attack rates, number of cases, duration) were compared according to the exclusion policy. Results were adjusted using logistic regression, first for all baseline variables that were statistically significant at  $P < .05$  and then for all baseline variables with a significance level of  $P < .2$ . All analyses were performed using SPSS version 14 (SPSS Inc, Chicago, IL).

## RESULTS

During the study period, a total of 32 outbreaks were reported in Suffolk and 64 outbreaks were reported in Norfolk. All outbreaks in Suffolk were managed with a 48-hour exclusion policy, and all outbreaks except 1 in Norfolk were managed with a 72-hour exclusion period. One outbreak in Norfolk was reportedly dealt with a 48-hour exclusion, by recommendation of the care home management. This outbreak was analyzed as with the Suffolk cases. Of the 96 outbreaks, only 34 (32.7%) were confirmed as NoV, and of these, 8 (23%) were of genogroup II, with the rest of an undetermined genogroup. No other viruses were identified.

The exposed population comprised 7229 people, of which 3490 (48.3%) were care home residents (50.3% in Norfolk and 44.5% in Suffolk) and 3559 (49.2%) were employed staff (45.9% in Norfolk and in 55.4% Suffolk). Of the outbreaks, 17 (16.3%) occurred in nursing homes, 11 (33.3%) in the 48-hour group and 6 (8.5%) in the 72-hour group ( $P = .019$ ). Information on the type of care home (ie, nursing or residential home) was missing for 21 homes (20.2%), all in Norfolk. Otherwise, the outbreaks managed with a 48-hour exclusion policy did not differ in their baseline characteristics (ie, number of residents and staff or cases before initiation of interventions) from those managed with a 72-hour exclusion policy (Table 2).

The average delay between the onset of the first case and reporting of the outbreak to the HPU was 3.7 days (3.5 days in the 72-hour group vs 4 days in the 48-hour group;  $P = .967$ ). There were no differences in the attack rates in residents and staff before initiation of any intervention (Table 2).

Once intervention started, the average number of staff reporting sickness in the control group was greater than that in the 72-hour intervention group

**Table 2.** Preintervention care home and outbreak characteristics according to exclusion policy

	72-Hour Exclusion (n = 63)	48-Hour Exclusion (n = 33)	P Value
Type of care home			.019*
Nursing home	6 (8.5%)	11 (33.3%)	
Residential home	44 (62.0%)	22 (66.7%)	
Information missing	21 (29.6%)	-	
Mean number of residents (SD)	36.7 (10.7)	34.6 (16.7)	.458
Mean number of staff (SD)	37.7 (15.8)	42.7 (25.6)	.792*
Mean staffing ratio (average number of staff per resident) (SD)	1.1 (0.3)	0.9 (0.4)	.127
Mean number cases among residents before intervention (SD)	10.7 (6.3)	9.7 (5.7)	.443
Mean number of cases among staff before intervention (SD)	4.2 (5.2)	4.2 (3.8)	.441*
Mean attack rate before intervention (SD)	22.7% (15.3)	20.8% (14.4)	.624*
Mean delay in reporting outbreak, days (SD)	3.5 (3.1)	4 (4.9)	.967*

\*Mann-Whitney *U*-test.

(5.5 vs 2.8; unadjusted  $P = .001$ ) (Table 3). This difference became statistically insignificant after adjustment for the provision of nursing and staffing rates. There were fewer cases among staff in the 72-hour policy group; on average, the control group had 9.6 staff illnesses over the course of an outbreak, compared with 6.5 in the 72-hour group (unadjusted  $P = .044$ ). The postintervention and overall attack rates also were lower in the 72-hour group, due mainly to the lower attack rate among staff (19.2% vs 26.2%; adjusted  $P = .015$ ). There were no significant differences in the duration of outbreaks with either intervention (16.8 days with the 72-hour group vs 15.5 days with the 48-hour group;  $P = 2.48$ ).

## DISCUSSION

We believe that this is the first study to evaluate the effect of different periods of staff exclusion on the outcomes of outbreaks of viral gastroenteritis. Outbreaks managed with a longer exclusion period had lower overall attack rates than those managed with a shorter exclusion period. This is largely the result of the reduced number of cases among staff rather than among residents.

This effect could be the result of exposure of care home staff to ill residents as well as to infectious work colleagues. Whereas staff protect themselves against infection from residents by using personal protective equipment, such as aprons and gloves, and washing their hands, they may relax these measures when they are with colleagues or in common areas (eg, staff toilets and changing rooms, common rooms, kitchens), which may be cleaned less frequently than

**Table 3.** Intervention outcome characteristics according to the exclusion policy

	72-Hour Exclusion, Mean (SD) (n = 63)	48-Hour Exclusion, Mean (SD) (n = 33)	Unadjusted P Value	Adjusted P Value*	Adjusted P Value <sup>†</sup>
Cases among residents after intervention	4.4 (6.1)	5.9 (5.4)	.073 <sup>‡</sup>	.063	.764
Cases among staff after intervention	2.8 (4.1)	5.5 (4.9)	.001 <sup>‡</sup>	.066	.163
Total number of cases among residents (before and after)	14 (8.4)	15.3 (7.7)	.450	.769	.691
Total number of cases among staff	6.5 (6.4)	9.6 (6)	.006 <sup>‡</sup>	.019	.044
Attack rate among residents	42.4% (23.2)	48.9% (27.3)	.212 <sup>‡</sup>	.140	.226
Attack rate among staff	19.2% (19.5)	26.2% (18)	.024 <sup>‡</sup>	.030	.015
Attack rate after intervention	15.2% (26.1)	19% (14.8)	.007 <sup>‡</sup>	.521	.083
Attack rate (overall)	32.6% (23.1)	35.1% (16.3)	.202 <sup>‡</sup>	.302	.05
Duration of outbreak (days)	16.8 (6.5)	15.5 (6.3)	.262 <sup>‡</sup>	.516	.248
Intervention (days)	13.4 (5.9)	11.5 (3.7)	.163 <sup>‡</sup>	.160	.092

\*Adjusted for type of care home.

<sup>†</sup>Adjusted for type of care home and staffing rates.<sup>‡</sup>Mann-Whitney U-test.

areas used by residents. For instance, a recent investigation of an outbreak of NoV in elementary school demonstrated the environmental presence of NoV in computer mice and keyboards.<sup>19</sup>

The staff exclusion policy used in managing an outbreak is less likely to affect the attack rate of residents, whose level of exposure depends more on other control measures in place in the care home (ie, isolation of cases, cohorting, handwashing, hygiene).

Our study has several limitations. Because it is a retrospective study, the effect of systematic differences in the handling of outbreaks by different health protection staff in Norfolk and Suffolk could not be limited. The data were routinely collected through the course of the outbreak investigation, and thus the number of care home characteristics was limited, which in turn limited the degree of adjustment for potential confounders. Differences between these 2 rural counties, such as sociodemographic characteristics and supporting local structures, may affect the well being of the elderly population. We were unable to control for sociodemographic characteristics, such as education or economic status of the care home residents, because we did not collect patient-level data.

As a proxy measure for quality of care, we used the type of care home to adjust the analysis. Information of the type of care home was not available in all of the notes. Although it would have been possible to ascertain the type in each case, some care homes may have changed type, and current information may not accurately reflect the situation existing at the time of the outbreak. Thus, care home type is less accurate, and, consequently, we used staffing rates to adjust the analysis.

Another limitation of the study is that although all of the outbreaks were managed as suspected viral gastroenteritis, only one-third of them actually were confirmed to be caused by NoV. The remainder may not have been fully investigated due to a lack of sufficient or adequate fecal samples.

One of the arguments against changing from a 48-hour to a 72-hour exclusion policy is that the latter would have considerable resource and financial implications for care homes and hospitals. Our analysis suggests that a longer exclusion period results in a significant reduction in the number of staff affected and thus requiring exclusion. In our study, on average 5 to 6 staff members were excluded for 48 hours, whereas only 3 needed to be excluded for 72 hours once outbreak control measures were put in place. This would result in a net savings of 1 to 2 staff days with a 72-hour exclusion policy, helping save resources in care homes.

Further research into the effect of interventions and policies to control outbreaks of viral gastrointestinal infections in different settings is needed to ensure that the best possible outcomes are achieved.

We believe that there is no difference in the overall duration of an outbreak with the 2 exclusion policies; however, there are possible benefits of a 72-hour exclusion, not only in reducing the numbers of staff off sick, but also in reducing the overall number of staff-days taken off. These differences in outcome and the potential benefits for care homes, although not enough to justify a change in policy based on results from a single study, should stimulate more rigorous research into the effect of different control policies.

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